will prove that, as Wormser claims, iodothyrin is not the only active body secreted by the thyroid, but that some other substance must act with it in order to perform all the functions of the gland.

Wormser's experiments were carried out upon dogs whose thyroids had been carefully removed. The animals were fed with various preparations made from thyroids as well as such artificial compounds as sodium iodide and iodo-casein, and the influence of these substances, in preventing or lessening the tetanus and other symptoms resulting from the operation, was noted.

The first animal experimented upon was fed with dry thyroids for twenty days after the thyroidectomy, and during this time its condition showed nothing abnormal. On the twenty-first day the dry thyroids were replaced by iodothyrin in such quantity that the iodine content equaled that of the previously administered glands. Two days later the animal was seized by a violent tetanus. The dry thyroids were again administered, and the dog recovered in a few hours. The glands were again replaced by iodothyrin, and the animal died within thirty-six hours. This experiment was repeated three times with iodothyrin prepared from sheep and pigs by both of Baumann's methods, and the results agreed perfectly.

Iodo-casein, an artificial compound, has been found efficacious in reducing the size of a goitre. When this substance was administered to dogs whose thyroids had been removed, the intensity of the tetanus seemed to be reduced, but death nevertheless ensued. Similar experiments were tried with sodium iodide, and with the albuminous material precipitated from a sodium chloride extract of the thyroid gland by acetic acid. These results, however, were entirely negative.

Wormser notes, however, that throughout these investigations he found young animals far more susceptible to the evil effects of thyroidectomy than fully mature or old animals, while the appearance of tetanus and other symptoms was delayed by a milk diet, but hastened by one largely composed of meat.

Finally, in summing up the results of his experiments, Wormser points out that the thyroid itself or an aqueous extract of the gland is far more potent physiologically than any substance yet isolated from the gland or artificially prepared, and that therefore no one substance can account for all the functions of the thyroid.

YANDELL HENDERSON.

THE ENZYMIC FERMENTS IN PLANT PHYSIOLOGY.

FERMENTATION, as a general term, covers many of the most important processes in chemistry. Fermentations are of many particular kinds, each depending more or less distinctly upon some specific ferment agent. This makes it convenient to classify the fermentation processes according to the correlated ferment agents. Thus we have yeast fermentation, bacterial fermentation, enzymic fermentation and the like.

The ferment agents, and, following them, the fermentation processes, may be roughly thrown into three classes: (1) Those belonging to the lower orders of fungi, like yeast. (2) Bacteria, like those present in the 'mother' of vinegar, or in the souring of milk. These two classes are often called organic ferments in distinction from the next. (3) Unorganized, or soluble ferments, or enzyms, like diastase, pepsin and ptyalin. The knowledge of these enzyms is mostly of very recent development, and is still fragmentary and generally unsatisfying. They have been best known as they occur in the animal digestive juices. The students of animal physiology have been used for some years to point out the presence of ptyalin and diastase in saliva, of pepsin and trypsin in the gastric juice, and

of pancreatin, trypsin and diastase in the pancreatic secretions. And in a very hazy sort of way it has been known for a considerable time that the same and similar ferments are active in the physiological processes of plants. In very recent years the sharp press of experiment upon all phases of plant economy has brought to light many facts of almost startling interest. We may reasonably hope to collect observations enough within a few years to make generalization practicable; but up to the present we are doing fairly well to get some detached notions of certain of these enzyms, of their nature and action, and their relation to important vegetation processes.

The certain determination, even qualitatively, of all the enzyms present in any given part of a plant can hardly be safely made in any case; but it is known that various enzyms are present in nearly all the living organs. Each plant—especially among the flowering plants—takes up quantities of food materials, which it circulates, digests, stores, unstores, circulates again, assimilates, breaks down and finally, perhaps, excretes. In all the multifarious processes of digestion and redigestion the enzyms may take prominent part. They are almost always found in connection with special food storages, as in buds, tubers, bulbs and seeds.

Before a healthy deciduous woody plant enters upon its period of rest it stores up a considerable quantity of food with which to begin work again in the spring. These storages are largely of starch, and may be demonstrated by the iodine stain under a lens in the woody tissues of stems, especially near buds, or in the roots. The regions of fruit buds in such plants as apple and plum commonly show remarkable storages of this sort. With returning spring, before the roots start or before the leaves are put out to capture and digest food, these stores of starch and other materials are put in motion once more, and from them the new leaves are built or the early blossoms pushed forth. Theoretically and from experiment we are led to believe that these early redigestive processes are dependent on certain enzymic ferments.

In a quite similar manner those plants which propagate their species by means of tubers or bulbs store quantities of food in such organs which later can be reabsorbed and used to start the young plantlet. The recent remarkable results reported by Johanssen before the Agricultural High School of Copenhagen, and so liberally noticed in the public prints of America, were brought about by the application of ether fumes to secure an early liberation of these stores of food in bulbs and dormant woody plants.

Seeds act in the same way. When perfectly ripe and viable seeds are brought into conditions favorable to germination, the relatively large stores of food which they contain are released for the use of the nascent plant. In this case the activity of diastasic ferments is comparatively well known. Perhaps other enzyms are also present and active. The chief commercial source of diastase, in fact, is malt, that is, grain taken at the height of the germination activities. It has been often observed that seeds do not germinate well if planted immediately after ripening; that a period of rest increases the promptness and vigor of germination; and it has been thought probable that this period of rest is useful in allowing the accumulation of the necessary enzymic ferments.

One of the facts of commonest knowledge is that seeds deteriorate in viability when kept for some time. The period at which all the seeds of a sample lose their power of germination varies from two to twenty years or more, but most garden seeds deteriorate rapidly after they are three years of age. It has seemed probable that this

reduction in viability is due to the diminution in quantity or loss in quality of the enzyms in the seeds. Some very interesting experiments made in the experiment station of the University of Vermont tend to establish this theory, as well as to offer some applications of practical value. Various old seeds were treated with different enzym solutions and were then placed in suitable apparatus for germination. One lot of tomato seeds, twelve years old, soaked for twenty-four hours before germination, gave the following results:

Soaked in water,	28	per cent. germinated.
Soaked in trypsin,	56	" "
Soaked in Extractum pancreatis	36	" "
Soaked in Enzymol,	52	" "

Another lot of seeds of another variety of tomato, twelve years old, gave these results:

Soaked in water,	34	per cent. germinated.
Soaked in diastase,	70	" "

One of the most remarkable experiments was with another lot of tomato seeds, also twelve years old. The result stood:

Soaked in water,	12	per cent. germinated.
Soaked in pepsin,	80	" "
Soaked in diastase,	85	" "

This shows an increase of 567 per cent. and 608 per cent. respectively in the germination through the action of the enzyms artificially supplied. Other seeds of other species and other enzymic preparations gave similar results.

In view of our present knowledge it seems quite fair to hope that, when we understand better the enzyms and their relation to the processes of vegetable physiology, we shall be able to control to our advantage many of the critical steps in plant development.

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CURRENT NOTES ON ANTHROPOLOGY.

THE OLDEST CRANIA FROM CENTRAL MEXICO.

In his work, 'Anthropologie du Mexique,' published in 1884, Professor Hamy gave the measurements of a number of skulls obtained from sepultures of uncommon depths in various parts of central Mexico. Those at Tlaltelolco were from seven to eight feet below the surface and appeared to date from a remote antiquity. These skulls were all characterized by marked brachycephaly, with indices of 85 and upward.

In the *Bulletin du Museum d' Histoire Naturelle*, 1897, No. 6, the same author reports the measurements of five skulls from very ancient burial sites in the district of Colotlan, State of Jalisco. The cranial capacity is good (male 1485, female 1280), but all five of them were remarkably brachycephalic, the average being above 86, and the highest reaching 92.40!

The modern graves, on the other hand, yield skulls which are distinctly dolichocephalic, and the present native population is of this character. They are the Guicholas, speaking a dialect of Nahuatl. They assert that these older graves are not those of their ancestors, but of another race; and the difference in the art-remains substantiates this tradition. Professor Hamy concludes that all the oldest tribes of central Mexico were broad-skulled, with marked alveolar prognathism.

THE OLD LAND-BRIDGE TO EUROPE.

In the introduction to my 'American Race' I pointed out the arguments for the existence of a land-bridge from North America to Europe in pleistocene times, across which the ancestors of the American man might have journeyed. Since the publication of that work a number of writers have advocated this hypothesis, as Georges Hervé, Charles Tissot, M. Lapparent, etc. The latest is M. Philippe Salmon, ex-President of the Anthropological Society of Paris.